



The kinetics of plant available phosphorus extraction from soil by Mehlich 3 method

Mart Rinken (1), Tõnu Tõnutare (1), and Allan Künnapas (2)

(1) Estonian University of Life Sciences, Tartu, Estonia (tonu.tonutare@gmail.com), (2) Quantum Eesti AS, Tartu, Estonia (allan@quantum.ee)

Phosphorus (P) plays a very important role in life processes in the World. The high content of P in soil is prerequisite for high yields in modern intensive agriculture. Unfortunately the P from highly fertilized soils tends to leach out and act therefore as pollutant for the environment. Also the raw material for producing the mineral P containing fertilizers is non renewable and contains toxic heavy metal impurities. For that reason the correct determination of soil extractable and plant available forms of phosphorus becomes more and more important both for farmers and ecologists.

For determination of phosphorus content in soil many different methods are developed and are in use. In European countries there are more than 12 official methods in use for determination of soil plant available phosphorus content.

Mostly the methods are based on leaching of soil with extracting solution and thereafter the determination of dissolved phosphorus in solution. Official methods used today in Europe for determination of soil P status are quite old, developed 50 and more year ago. The Mehlich 3 (M3) method, developed in 1984, is the youngest among these methods. Due to its multielemental nature this method became popular in World and is in status of official method for phosphorus in three European countries: Estonia, Czech Republic and Slovak Republic. Despite being an official method there are yet several discussions about the correctness of the results.

Usually the extraction of soil phosphorus is provided during some period of time needed for establishing equilibrium between phosphorus content in extract and on the soil particles surface. There are only three methods: M3, Bray P1 and Chirikov where extraction phase lasts only 5 to 10 minutes. We assume, that the extraction time is too short for establishing equilibrium between phases and the correctness of analysis depends from exact tracking of duration of extraction. The extraction speed for different phosphates from soil is unequal and therefore it will be problematic for providing of routine analysis and will be a source of inaccuracy.

Our aim was to establish the kinetic parameters of P extraction from different agricultural soils by M3 method and find factors which affect the extraction process. Also we are interested in how the extracted P is influenced by forms of phosphates in soil.

For investigation agricultural soil samples with different pH values, P-, organic C-, carbonate content and texture were used. The phosphorus content was determined by molecular spectrometry and microwave assisted atomic emission spectrometry

As a result of the investigation the kinetic parameters of P extraction from soils by M3 method and affecting was established